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THE AURORA BOREALIS.

[Aurora Borealis.]

THE Aurora Borealis is a beautifully luminous meteor, appearing in the form of streams of light, rays, arches, and crowns. A description of this splendid phenomenon, which enlivens the long darkness of the Arctic regions, has been given by Mr. A. De Capell Brooke, in his 'Winter in Lapland,' to which work we are indebted for the subject of our cut. But we shall take the liberty to condense his account, and to generalize it by some details from other sources.

He states, that in September the approach of the winter season led to the expectation that the Northern Lights would soon appear, and in the hope of observing them he generally walked out after dark. On the 21st he first obtained a sight of them. The night was clear and frosty, with little or no wind, and, on going out about midnight, the heavens were perfectly illuminated. The lights flitted along with amazing velocity in large patches of a pale hue, without assuming any defined form. They proceeded from the north-east, disappearing in the opposite quarter, and continuing to rise at intervals behind the Soröe mountains. Subsequent observations showed this to be so generally the course of the Aurora, that he habitually directed his attention to the north-eastern part of the horizon when watching for it. Its first appearance was generally that of irregular gleams of light, which exhibited an exact resemblance to the reflexion of a distant fire; and rarely remained low in the horizon, but mounted up towards the zenith, and there assumed an inconceivable variety of form and diversity of motion.

The appearances of the Aurora increased in number and brilliancy with the advance of the season. Sometimes it formed a splendid arch across the heavens, of pale lambent flame, running with inconceivable velocity, and resembling the spiral motions of a serpent. This arched form of the Aurora seems the most magnificent of all its diversified appearances, and we are enabled, from other observers, to furnish a more particular description than Mr. Brooke supplies. The arches are sometimes single; and sometimes several concentric ones appear; but, generally, they rarely exceed five, and are seldom limited to one. They are sometimes composed of a continuous stream of light, bright at the horizon and increasing in brilliancy at the zenith; and, when the internal motion is rapid, and the light brilliant, the beams of which they are composed are discernible. This internal motion appears as a sudden glow, not proceeding from any visible concentration of matter, but bursting forth in several parts of the arch, as if an ignition of combustible matter had taken place, and spreading itself rapidly towards each extremity. Mr. De Capell Brooke, in the inscription of the plate which we have copied above, says, "The Author in his travelling-dress as he travelled through Lapland, with an appearance of the Northern Lights." The arch in the plate is defined at the top; but in the arches described by Captain Parry, the

lower part only was generally well defined, the space under it appearing dark as if a black cloud had been there, which, however, was not the case, as the stars were seen in it unobscured except by the light of the Aurora. The revolution of an arch from north to south occupies at different periods a space of time varying from twenty minutes to two hours; and sometimes it appears stationary for several hours together.

Innumerable streams of white or yellowish light appear sometimes to occupy the greater portion of the heavens to the south of the zenith. Some of these streams of light are in soft lines like rays, others crooked and waving in all sorts of irregular figures, and moving with great rapidity in various directions. Among these might frequently be observed the shorter collections or bundles of rays, which, moving with greater velocity than he rest, have acquired the name of *merry dancers*.

Total darkness would sometimes ensue from the sudden disappearance of the Aurora; and then it would as suddenly reappear in forms altogether different from those which preceded, overspreading the sky with sheets of silvery light, wafted quickly along, like thin strata of clouds, before the wind. Sometimes narrow streaks of flame shoot forth with extreme velocity, traversing in a few seconds the entire concave of the heavens, and disappearing beneath the south-eastern horizon. Occasionally broad masses of light suddenly appear in the zenith, and descend towards the earth in the form of beautiful continuous radiated circles.

Speaking generally, the lustre of the polar lights may be described as varying in kind as well as intensity. Sometimes it is pearly, sometimes imperfectly vitreous, sometimes also metallic. Its degree of intensity varies from a very faint radiance to a light nearly equal to that of the moon.

The colours of the Aurora Borealis are of various tints, and do not seem to depend on the presence of any luminary, but to be generated by the motion of the beams. The *rays* or *beams* are steel-grey, yellowish-grey, pea-green, celandine-green, gold-yellow, violet-blue, purple; sometimes rose-red, crimson-red, blood-red, greenish-red, orange-red, and lake-red. Some of the beams appear as if tinged with black, and resemble dense columns of smoke. The arches are sometimes nearly black, passing into violet-blue, grey, gold-yellow, or white, bounded by an edge of yellow. The colours are also sometimes vivid and prismatic. Maupertuis describes a very remarkable red-coloured polar light, which he observed at Oswer Zornea on the 18th of December, 1786. An extensive region of the heavens towards the south appeared tinged of so lively a red, that the whole constellation Orion seemed as if dyed with blood. The light was for some time fixed, but soon became moveable, and after having successively assumed all the tints of violet and blue, it formed a dome, the summit of which approached the zenith in the south-west. Its splendour was so great as to be in no degree affected by the bright light of the moon.

Early observers were disposed to assign to the Aurora an immense elevation above the surface of the earth. The height of that seen in 1737 was computed at 825 miles. Bergmann, from a mean of thirty computations, forms an average estimate at 460 miles. Euler gives the altitude of several thousand miles to the Aurora; and Mairan fixes the elevation of the greatest number at 600 miles at least. Dr. Blagden brought it down to 100; and Mr. Dalton could not assign a less elevation to the Aurora seen in this country in 1826. But the result of the observations made by the several arctic expeditions seems to be, that the height of the Aurora is different at different times; it often occurs at elevations much higher than the region of clouds; though instances are mentioned by Captain Franklin and Dr. Richardson, in which the Aurora has been seen at a less elevation than that of dense clouds, the *under* surfaces of which they often saw illuminated by the meteor.

The magnetic property of the Aurora—or its power of agitating the magnetic needle—had long been suspected by philosophers; and though still doubted by some, and not confirmed by the observations of Captains Parry and Foster, seems now sufficiently established by the observations of Captain Franklin, Lieutenant Hood, and Dr. Richardson. At present, however, little more than the fact seems to have been ascertained; as great obscurity still hangs over the cause from which this effect proceeds, and the mode of its operation; and it sometimes happens that one observation has a tendency to neutralise the conclusion to which another would lead. The Aurora sometimes approached the zenith without producing the usual effect on the position of the needle. It is generally most active where it seems to have emerged from behind a cloud; and the oscillations appear only to take place when beams or fringes of the meteor are on the same plane with the dip of the needle. Captain Franklin was led to consider that the effect of the Aurora on the needle varied with its height above the earth. That it did not depend on the brilliancy of the meteor was manifest, from the fact that, in hazy, cloudy nights, the needle deviated considerably, though no Aurora was then visible; and he felt unable to determine whether this proceeded from a concealed Aurora behind the clouds, or entirely from the state of the atmosphere. Clouds sometimes during the day assumed the forms of the Aurora, and he was inclined to connect with their appearance the deviation of the needle, which was occasionally observed at such times.

The appearance of the Aurora is said to be sometimes attended with singular noises. Though Parry, Franklin, Richardson, Scoresby and others never heard such noises, and Hood and Brooke only *think* they did, all express an inclination to defer to the uniform testimony of natives and residents so far as to admit that such sounds may be sometimes audible, but their rare occurrence is demonstrated by the fact, that Captain Franklin's party felt unable to confirm this report, though the appearance of the Aurora had been registered 343 times at Bear Lake in the season 1825-1826. The noise, as described, appears to be a sort of crackling, whizzing, rustling sound, compared to that of an electric spark,—to the falling of hail,—to the rustling of a large flag in a gale of wind,—to the noise made by a flock of sheep in breaking through a hedge,—to that caused by shaking or waving a piece of paper,—and to the rushing of wind. Professor Jameson declares his belief in the existence of such sounds, and states that he has himself heard them; but he affords no explanation of the phenomenon.

In the polar regions the Aurora begins to appear in August, and continues till May; but the lights are the most intensely luminous from November to March. The number observed in the season 1820-1821, at Fort Enterprise, is thus registered by Lieutenant Hood: In August 10, September 6, October 7, November 8, December 20, January 17, February 22, March 25, April 18; in May, the brightness prevented more than nine from being observed. This is more than double the number observed at Cumberland House in the same season.

The Aurora is very various in its duration. It sometimes appears and disappears in the course of a few minutes; at other times it lasts during all the night, and occasionally continues for two or three days together.

The Aurora has, at different times, been seen in most parts of northern and central Europe. Dr. Halley has left a description of one which appeared in 1716, and which attracted very general attention. Since that time they have frequently been seen in England. Ac

counts have been published of those which appeared in 1826 and 1831. In the Shetland Islands, the *merry dancers*, as they are there and elsewhere called, are the constant attendants of clear evenings, and serve materially to diminish the gloom of the long winter nights. It was for a long time doubtful whether this meteor was confined to our hemisphere, or made its appearance also in the other; but the observations of navigators have demonstrated that the Aurora occurs as well in the antarctic as the arctic regions, though with considerable diversity in the accompanying phenomena. It is, for instance, noticed that the Aurora Australis is generally of a whitish colour, whilst various tints are assumed by the Aurora Borealis.

MINERAL KINGDOM.—Section 20.

COAL.

The mode of working coal-mines varies in different parts of the country, partly on account of the situation of the seams of coal in the ground, and partly on account of customs peculiar to the spots. That which we are about to describe is the method usually adopted in the Newcastle Coal Field; the chief sources of information on the subject being contained in the evidence given before the Committees of the Houses of Lords and Commons in 1829 and 1830, by Mr. Buddle and Mr. Taylor, eminent engineers or coal viewers, and of large experience in the north of England collieries.

No instances occur in this country of beds of coal lying so near the surface that they can be worked in open day like a stone quarry, nor are they often met with in the side of a hill, so that the mines can be pushed forward in a horizontal direction. When, therefore, a coal-field is to be *won*, as it is technically called, that is, when the coals are to be taken out, the first step is to sink a perpendicular circular shaft like a great well, in order to get at the coal, and by which the miners or pitmen descend, and the coal is brought to the surface. The sum required for winning a field of coal, that is, the coal under a certain portion of land marked out on the surface, is sometimes so considerable, and the risk of failure so great, that very few individuals venture upon it on their sole account. They are usually won by a company, called adventurers, who take a lease from the proprietor. On the river Tyne there are only five proprietors, out of the forty-one collieries, who work their own mines, and on the river Wear there are only three out of eighteen collieries; all the rest are in the hands of lessees or adventurers. The capital is raised by shares, often of small amount, and being transferable are constantly in the market. Collieries vary exceedingly as to the amount of capital required to win them, the difference being so great as from £10,000 to £150,000. One of the difficulties in sinking a shaft is passing through quicksands; another is the immense quantities of water which are met with in certain parts of the stratification, generally within forty or fifty fathoms from the surface, which is always dammed back by a tub. Mr. Buddle mentions a shaft in which he had to apply forty fathoms, that is, 240 feet, of cast-iron tubbing. Besides, one shaft is not sufficient, another being required for drawing up the water and for ventilating the mine.

The depth of the mines is very various; in one place near Jarrow, about five miles from the mouth of the Tyne on its southern bank, the high main coal of the Tyne is found within 42 feet of the ground, and the same coal lies under Jarrow Lake more than 1200 feet from the surface. This great depth is not reached by one perpendicular shaft, but a shaft and steam-engine under ground, with descending inclined planes. A great improvement was made by this erection of steam-engines to be worked in the pits underground, and which first took place in 1804.

The pit having been sunk to a sufficiently thick seam of coal, the process of excavating it begins, by cutting out the coal laterally in what are called galleries. In the Newcastle mines large masses of the coal, named pillars, are left to support the roof, at short intervals; but in Staffordshire the whole of the coal is taken away, and the roof of the mine is suffered to fall down, care being taken to support it so far as not to endanger the safety of the workmen. One set of workmen is employed in digging out the coal, and another in removing it to the bottom of the shaft, from whence it is drawn up by machinery to the surface. The work of the miners is very laborious, especially where the seams are so thin as to prevent their being in an erect posture.

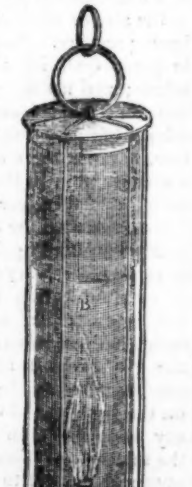
In many collieries, after the whole of the coal has been got out in the ordinary way of working, they gradually cut away a part of the pillars of coal which had been left at intervals, for the support of the roof, substituting props of timber; and sometimes the whole of the pillar may be taken away without the roof falling in in such a manner as to impede the workman in other parts of the mine. When the whole of the coal has been excavated and the roof does not fall down, vast empty spaces or wastes are left, which very generally after a while, become filled with water, to the great danger of the adjoining collieries.

The chief accidents to which collieries are exposed, besides that of the roof and floor coming together, by the pressure over the places where the coal has been worked out, are inundations of water, and explosions of gas. The quantity of water which flows into the mines is sometimes quite enormous, and the expense of drawing it off by pumps worked by steam-engines is one of the heaviest charges of a colliery. Mr. Buddle states, that in one with which he is connected, they draw eighteen times the weight of water which they do of coal. It very often happens that a mine is drowned by an accidental opening into an old working filled with water.

But of all the accidents to which coal-mines are exposed, the explosions of inflammable gas or fire-damp are the most frequent, and by far the most calamitous in their consequences. All coal, even the charcoal-like variety called anthracite, appears to contain, in its natural state while underground, a considerable quantity of free uncombined gas, which it parts with when exposed to the air, or when it is relieved from great superincumbent pressure. The gas is evolved from the coal in great quantity at the ordinary temperature of the mines; and instances have been known of explosions on board of ships laden with fresh-worked coals. Coals lying deep give out more gas than those near the surface, because there are openings at the surface by which it escapes; but in the deep mines it cannot have such an outlet, and therefore it accumulates in all the fissures of the stone above the coal, and this sort of natural distillation is constantly going on. The fissures of the roof are in some places very great, and there are sometimes miles of communication from one fissure to another: they may be considered as natural gasometers, and having no outlet, and the process of distillation constantly going on, the gas becomes accumulated in them in a very highly condensed state, the degree of condensation depending on the thickness of the surrounding rock and the quantity poured in. In the course of pursuing the workings the miners sometimes cut across one of those fissures, or approach so near to it, that the intervening rock becomes too weak to resist the elastic force of the compressed gas; it gives way, and then, in either case, the gas rushes out with immense force. These *blowers*, as they are called, emit sometimes as much as 700 hogsheads of gas in a minute, and continue in a state of activity for many months together. Sir James Lowther found a uniform current of gas in one of his mines for two years and nine months.

This gas, in the state in which it issues from the coal, burns with a bright flame, like ordinary artificial coal gas; but when united with a certain proportion of the air of the atmosphere, the mixture becomes explosive, that is, the whole volume of air, upon the approach of a flame, suddenly catches fire, and goes off like gunpowder, with a tremendous explosion. If there be more than one volume or bulk of the inflammable gas to fourteen of atmospheric air, the mixture is explosive, and must not be approached with a naked flame. Great pains are taken to ventilate the mines so as to free them from this foul air, by large fires kept constantly burning at the mouth of the ventilating shaft, aided very often by air-pumps worked by steam-engines, to quicken the draft; and which are sometimes so powerful as to draw out of the mine 1000 hogsheads of air in a minute. One mine is described by Mr. Buddle as generating so much gas as to require a supply of 18,000 cubic feet of atmospheric air in a minute to keep it in a safe working state. Men can continue to work and breathe in an explosive mixture of the gas without feeling any material inconvenience; and formerly such places were approached by making use of what were called Steel Mills, to give light. This machine consists of a small wheel of steel, of six or seven inches diameter, moved by a little toothed wheel with great velocity, and by holding a piece of flint to the steel, a stream of sparks is given out. Although in the day the light appears very feeble, in the darkness of the mines it is strong enough to enable one to write by it; but the use of the steel mill is not free from danger of explosion in certain mixtures of the gas. That contrivance has, however, been now completely set aside by the important and beautiful discovery of Sir Humphry Davy, the SAFETY-LAMP.

That eminent philosopher instituted a long series of experiments on the nature of the fire-damp, and on the proportions with which it must be mixed with atmospheric air in order to become explosive. He found that, in respect of combustibility, the fire-damp differs most materially from the other common inflammable gases, inasmuch as it requires a far higher temperature before it can be set on fire; an iron rod, at the highest degree of red heat, and at the common degree of white heat, did not inflame explosive mixtures of the fire-damp, and an explosion only took place when a flame was applied. He further made the important discovery, that flame will not pass through a tube with a very small bore; and, guided by this principle, he was ultimately led, through a train of ingenious experiments, to the construction of an instrument which has saved, and will continue to save, the lives of hundreds, and which has rendered a large extent of property productive that the proprietors were unable to turn to any profitable account. The accompanying is a representation of "THE DAVY," as the safety-lamp is now called by the miners, a very fit mode of perpetuating the remembrance of their benefactor:—

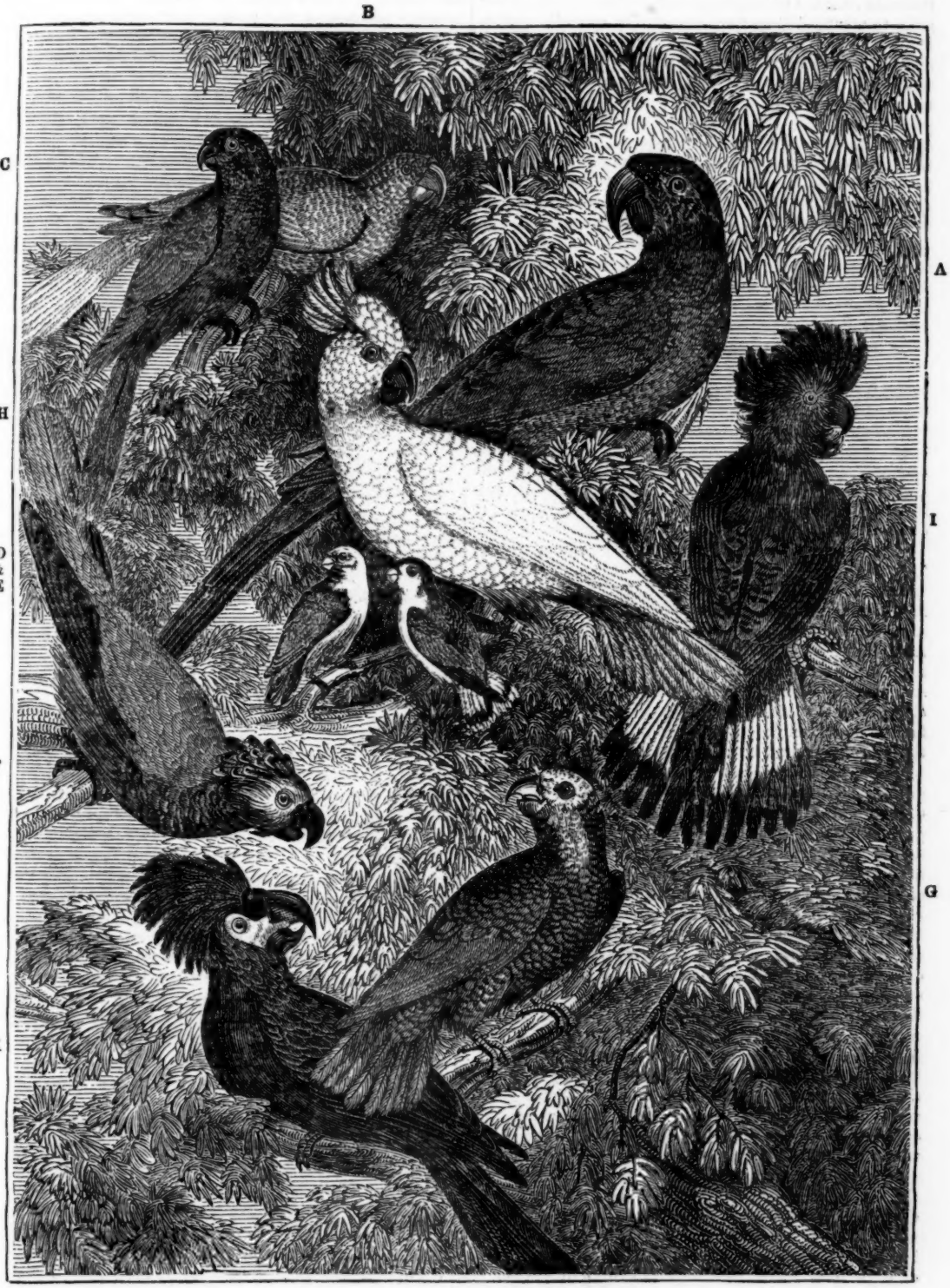


The construction of it is very simple: A. is the lamp, in which oil is used; and there is a small, bent wire, moved by passing smoothly through a hole in the bottom, for the purpose of trimming the wick. B. is a cover of fine wire-gauze, which is fastened upon the lamp, and generally locked to prevent the miners taking it off; and this cover is strengthened by upright wires, twisted at the top to receive a ring for carrying the lamp.

Some recent improvements have been lately introduced by the application of reflectors, for the purpose of concentrating the light. An account of the theory of this valuable instrument will, we have no doubt, be acceptable to our readers, and the following, which is partly taken from Dr. Turner's 'Elements of Chemistry,' will, we hope, make it easily understood. We have said that the construction of the lamp depends upon two principles discovered by Sir H. Davy, namely, that fire-damp will only explode at a very high temperature, and that flame will not pass through very fine tubes. Now the power of tubes in preventing the transmission of flame is not necessarily connected with any particular length, a very short one will have the effect, provided its diameter be proportionally reduced; and so Sir H. Davy, considering that fine wire-gauze is an assemblage of very short tubes with a very small bore, found that a gauze containing 625 apertures in a square inch, which is coarse enough to transmit a great deal of light, will not allow flame to pass through it. Any one may convince himself of this by holding a piece of fine wire-gauze over the flame of a candle, or, what is better, over the flame of a spirit-lamp, or of a gas-lamp, for in these cases the gauze becomes red-hot. Flame is gaseous matter heated so intensely as to be luminous, and, as we have said above, the flame of fire-damp is only kindled at a temperature much higher than that of iron at a white heat. Now when flame comes in contact with the sides of very minute apertures, as when wire-gauze is laid upon a burning jet of coal-gas, it is deprived of so much heat that its temperature instantly falls below the degree at which inflammation can be maintained, and consequently, although the gas itself is passing freely through the interstices, that portion of it which is above the gauze, although very hot, is not sufficiently so to be luminous,—that is, to be in a state of flame. Nor does this take place only when the wire is cold,—the effect is equally certain at any degree of heat which the flame can communicate to it; for since the gauze has a large extent of surface, and, from its metallic nature, is a good conductor, it loses heat with great rapidity. Its temperature, therefore, though it may be heated to whiteness, is always so far below that of flame as to exert a cooling influence over the burning gas, and reduce its heat below the point at which it is luminous. When the lamp is carried into a part of the mine which is highly charged with fire-damp, the flame of the wick begins to enlarge, and the air, if it contain so much of the inflammable gas as to be highly explosive, takes fire as soon as it has passed through the gauze, and then burning within the lamp extinguishes the flame of the wick, by cutting off all communication with the pure air of the atmosphere. Whenever this appearance is observed, the miner must instantly withdraw; for although the flaming gas within the lamp cannot pass through the gauze so as to set fire to the explosive mixture outside, it makes the wire gauze so hot that it would very speedily be wasted, and a hole, large enough to let the flame come out, would be burned.

Since the discovery of the Davy Lamp accidents by explosion have been considerably diminished, although we still hear too frequently of many lives being lost from this cause. These melancholy disasters are partly occasioned perhaps by venturing into too dangerous places, but most frequently by the carelessness and criminal daring of the workmen themselves, who, in order to get a little more light, take off the wire-gauze covering.

THE PARROT.



I. The Macaws. Tail long and pointed; cheeks naked.
A Psittacus Macao.

II. The Parrakeets. Tail long and graduated; cheeks feathered.
B Psittacus Carolinus.
C Psittacus squamosus.

III. The Psittacules. Tail very short, and roundish at its termination; cheeks feathered.
D Psittacus melanopterus.
E "Psittacule des Phillipines." } Very small parrots: about half as large again as a sparrow.

IV. The Parrots. Tail equal and squared; head destitute of moveable crest.
F Psittacus occipitrinus.
G Psittacus leucocephalus.

V. The Cockatoos. Tail equal and squared; head with a moveable crest.
H Psittacus sulphureus.
I Psittacus Banksii.

VI. Prosbociger (Aras à trompe). Tail equal and squared; naked cheeks, and tuft on head.
K. Psittacus Goliath.

IT does not seem necessary to enter into a detailed description of a bird so generally known as the parrot; it may suffice to state the principal characteristics which are common to all the different species of this splendid genus. Bill hooked, thick, and very hard and strong; the lower mandible short, obtuse, and turned up to the extremity; the upper mandible moveable, much curved downward to the point, and covered with a skinny case, which is pierced for open and orbicular nostrils. In most of the species the tongue is fleshy, obtuse, and entire. Feet formed for climbing with four toes, the two before united by a thin membrane at their bases, whilst the two behind are quite unconnected. The different species vary from the size of a swallow to that of a domestic fowl.

The parrot genus includes about one hundred and seventy known species. All the species are confined to warm climates, but their range is wider than Buffon considered, when he limited them to within 23° on each side of the equator; for they are known to extend as far south as the Straits of Magellan, and are found on the shores of Van Diemen's Land; and the Carolina parrot of the United States is resident as far to the north as 42°. Wilson saw them, in the month of February, along the banks of the Ohio, in a snow-storm, flying about like pigeons, and in full cry. And another time he saw them, about thirty miles above the mouth of the Kentucky River, as they came in great numbers, screaming through the wood, about an hour after sunrise, to drink the salt water, of which they are remarkably fond.

Parrots live together in families, and seldom wander to any considerable distance; these societies admit with difficulty a stranger among them, though they live in great harmony with each other. They are fond of scratching each other's heads and necks; and, when they roost, nestle as closely as possible together, sometimes as many as thirty or forty sleeping in the hollow of the same tree. There they sleep in a perpendicular posture, clinging to the sides by their claws and bills. They are fond of sleep, and seem to retire into their holes several times in the day as if to enjoy a regular *siesta*.

The young shoots of various plants, tender buds, fruits, grains, and nuts, which they open with much adroitness to obtain the kernel, are the chief aliments which the parrots use when in a state of liberty. We know that, in a state of domestication, they eat almost everything that is offered to them; but it has been remarked that certain substances, such as parsley for instance, which have no sensible effect on other creatures, are to parrots mortal poisons. In the forests, which are their favourite retreats, the parrots assemble in troops, and cause much devastation by the vast quantity of food which they consume, not merely for their subsistence, but to gratify that mania for destruction for which, even in their domestic state, they are noted. The loud cries of these bands are heard a great way off, when they seek their last repast before the setting of the sun. By these cries the planter has timely warning to employ some means of preventing these hosts of destroyers from alighting on his newly-sown fields, where, in a short time, they would not leave a vestige of grain.

The description which Wilson gives of the flight of the Carolina parrot is probably applicable to many other species which have not, in their wild state, been noticed by an equally intelligent observer. "There is a remarkable contrast between their elegant manner of flight and their lame and crawling gait among the branches. They fly very much like the wild pigeon, in close compact bodies, and with great rapidity, making a loud and outrageous screaming. Their flight is sometimes in a direct line, but most usually circuitous, making a great variety of elegant and serpentine meanders, as if for pleasure."

Some species establish their nests on the summits of the highest trees. The nest is composed of small sticks and slender twigs, interlaced with as much art as solidity. The rest, and this is by far the greater number, choose the trunks of hollow trees. They there amass dust and arrange grass and the filaments of roots, dressing the interior with their own down. The female lays from two to four eggs, altogether white, and sits on them with great constancy, whilst the male keeps himself at a small distance from the nest, attending to all the wants of his mate.

We cannot pass over the sort of education of which parrots are susceptible. They learn to speak, and can retain and repeat a tolerably long series of words. This is the result of a forced modification of the voice, to which they have been brought by the habit of hearing the same words or sounds frequently repeated; and which, by the instinct of imitation common to all animals, but perhaps more strongly developed in the parrot than in most others, they are able to retain. But in this language, the thought or sentiment expressed is of no account. We often hear parrots in the paroxysms of choler, to which they are so subject, use the same endearing expressions, which, when they are calm, frequently seem very intelligent and to the purpose, because they are commonly the answers to a very circumscribed circle of questions. The most remarkable parrot on record is that which is known as Colonel O'Kelly's, a notice of which appeared in page 36 of this Volume of the Penny Magazine.

Account of a Library for Working Men.—A correspondent, who gives his name and address, has been induced, by our notice of Sir John Herschell's Address to the subscribers of the Windsor and Eton Public Library, in No. 95 of the 'Penny Magazine,' to send us an account of a similar institution on the Borders, with which he had been himself connected. He states that a gentleman, well known for his enlarged views of the state and prospects of society, being one evening in the place, was led to inquire whether there was any public library in the town. He was informed in reply, that there was one of ample extent, the entrance-money to which was £5, and the annual payment 14*s*. Feeling this to be beyond the reach of the poor, he inquired if there was no other library. He was told that there was the "Tradesman's Library," the entrance to which was £1, and the yearly payment 4*s*. This was nearer the point certainly, but still did not exactly meet the views from which this gentleman's inquiries had proceeded. "It will not supply the young," was his reply; "you must try another, to excite the desire of knowledge among the young and the poor." The minister of the parish, his lady, and a few other persons adopted the suggestion. In a few days £20 were freely and readily given, and the donors were called to a meeting in the town-hall. At this meeting some were for allowing to the readers the gratuitous use of the books, but the majority very properly doubted the prudence of this plan, and it was decided to cherish the natural desire of independence in the poorest and youngest by requiring the payment of a penny monthly. It was also agreed that the volumes should be of small extent, that they might be returned once a month or oftener. The sum raised procured about eighty volumes, and a donation from the first mover of the plan added twenty or thirty more. The second week after the commencement there were above one hundred applicants, of whom about thirty were poor labourers or solitary females, and a larger number were under fourteen years of age. Numbers of them had not read two hours in succession for many years before. At the beginning of the second year the readers were allowed, at their own desire, to pay for six months at once, instead of a penny monthly. Our correspondent relates the following anecdote, which illustrates the useful effect of such institutions upon those for whose benefit they are intended.

In the following spring, when the days were lengthened, one of the readers, an agricultural labourer, came with the book he had been using, and declined to take another. He stated that, labouring at a distance for so many hours, he should not be able, during the summer, to indulge his desire for more reading. On being asked if he thought his monthly penny had been well spent, his hard countenance assumed the air of one who had found a treasure as he

replied,—"Had I paid you a shilling a week instead of a monthly penny, myself and family would have been gainers. During the winter months I and those like me got home and took dinner between four and five o'clock. Then an ill-ordered house and a noisy family induced me and others to go out. If the weather was favourable, we stood to talk and spend an hour at the Cross; if otherwise, we went into a smithy for shelter, and often to the public-house, and, though I am not given to drink, yet we had to spend a little when there, and even a little frequently occurring is felt by a poor man. When I took home my first book from the library I was asked to read aloud, but objected because of the noisy children. After some time, the younger were put to sleep, and I began to read. Next morning, and every evening after, my house was clean and in order, the fireside trimmed, my meal waiting, the children in bed, or allowed to sit up on condition of listening as quietly as their attentive mother. The book we obtained from the library was Goldsmith's 'Animated Nature,' and it has been highly interesting to us. And, Sir, apart from all we have learned by reading, to find, week after week, my own house the most comfortable, and my own family the happiest I ever saw, shows me that a poor man with his book in his hand may be as happy as the richest or most noble." This man concluded with assuring our correspondent that he had heard from others statements similar to that which he had made for himself.

MOUNT HECLA.

Some years ago, it was not uncommon for our sailors, on their way to Greenland and North America, to see a column of fire (whose base was a lofty peaked mountain) towering high in the air, and casting a ruddy glare over the dark, stormy seas for many a mile. This spectacle made a deep impression on the lively imagination of ignorant and superstitious seamen; who, returning to their homes, gave a naturally exaggerated description of what they had seen, and explained the phenomenon by assuming that it was produced by supernatural agency. This column of fire proceeded from Mount Hecla, which is one of the numerous volcanos we have mentioned in our short description of the island of Iceland. It is situated on the southern side of that island, at the distance of a few miles from the sea-coast; and, though neither so grand, as a mountain, nor so terrible, as the centre of volcanic action, as some of its neighbours, Hecla has been more celebrated than any of them, because, from its position, it has been more frequently seen by strangers, and because it has been more frequently in a state of eruption than any of the other volcanos.

The height of Hecla from the level of the sea is between four and five thousand feet. From some points of view its summit is seen divided into three peaks, of which the central peak is the loftiest and most acuminated: from other directions it seems to terminate in a single massy cone, like the volcano of Ætna.

One of the most singular features of Hecla, as compared with other volcanos, is the remarkable manner in which immense heaps of lava that have flowed from the mountain during different eruptions are ranged round its base, so as to form a sort of rampart from forty to seventy feet high. All travellers have been struck by the continuity and bright, glazed appearance of these walls. Von Troil calls them "high glazed cliffs,—lofty glazed walls," not to be compared to anything he had ever before seen; and Dr. Henderson describes them as "immense, rugged, vitrified walls," going all round the base of the mountain. To explain part of this appearance, it may be necessary to inform some of our readers that when lava passes from its liquid state and cools, it sometimes retains a shining, vitreous coat, not unlike glazed bricks, or some of the refuse thrown out of our glass-works. Beyond and above this immense rampart little more lava occurs, the rest of the mountain being composed almost entirely of sand and slags.

In 1772, the late Sir Joseph Banks, with Dr. Von Troil, Dr. Solander, and other friends, ascended Mount Hecla. The country for more than two leagues round it was wholly destitute of vegetation, the soil consisting of red and black cinders, scoriæ, pumice-stone, and other volcanic results; whilst here and there it rose into little hills and eminences, which were of greater size in proportion to their vicinity to the base of the mountain. These eminences, which were hollow within, were craters through which the subterraneous fire had at different times found vent. The largest of them, called Raud-Oldur, was described by Sir Joseph as a crater with an opening half a mile in circumference, and about one hundred and forty feet deep, having its western side destroyed, what remained being composed entirely of ashes, cinders, and pieces of lava in various states. Near to this crater the party pitched their tents, in the midst of a scene of almost inconceivable horror and desolation.

When they continued their route, and came to the rampart already described as surrounding the base of Hecla, they experienced considerable difficulty in climbing and crossing it, for they frequently found the lava lying in detached masses with deep holes between them. Having at length surmounted this difficulty, they found themselves on comparatively easy ground, and continued their ascent on the western side. Soon, however, they were somewhat alarmed by hearing a continual cracking beneath their feet. On stooping to examine whence this proceeded, they discovered that the whole mountain was composed of loose materials, easily broken, of sand and pumice-stone, lying in horizontal strata, everywhere full of fissures. Still continuing their ascent, they passed over a series of sloping terraces, and perceived that the sides of the mountain, from its summit to its base, were deeply scarred with ravines, formed originally by the descent of lava, but now serving as water-courses and beds for the winter torrents.

It was night when they gained the summit, and stood beside the great crater on a spot covered with ice and snow. The snows are not, however, of the nature of glaciers, as, except such portions as lie in hollows and clefts, they generally melt in the course of the summer. The cold at this time (in the month of June) was exceedingly severe. Sir Joseph Banks says that he and his companions were covered with ice in such a manner that their clothes were as stiff as buckram. The water they carried with them was all frozen. Here and there on the mountain-top they found great heat issuing from the ground and melting the snow for a little space round its vent. One of these spaces was so hot from steam and smoke that they could not remain on it; but they nowhere saw traces of the dangerous bogs, the waterfalls, the hot springs shooting in every direction, or the devouring flames, which the natives had stated to exist.

The silence and the solitude of the spot were awful. It was midnight, but in that northern latitude as bright as day: the prospect was immense. To the east they saw a long range of glaciers, beyond which the ancient volcano of Hoerdabreid presented its peak, which looked like a great castle; to the north were lofty hills and many lakes. The view, however, seems to have been the only very interesting thing they met with on the summit of Hecla. They descended on the western side by a very deep ravine, which, commencing at the top of the cone, and continuing to the very foot of the mountain, appears clearly to have been the bed of a prodigious stream of lava, and was probably formed during the eruption of 1300, when, as Icelandic chroniclers relate, Mount Hecla was rent from top to bottom. Large masses of rock, as cast out by the crater, still hung over the edges of the ravine, and greater heaps of melted and burnt substances were found at the bottom of this singular and immense chasm.

When Sir G. S. Mackenzie, Dr. Holland, and Mr.

Bright ascended this volcano in the summer of 1810, they found a much greater degree of heat proceeding from the mountain. Hot vapours issued from several parts of the central peak, and the heat of the ground was so great, that on removing a few of the slags from the surface, those a little below were too hot to be handled. On placing a thermometer amongst them, it rose to 144°. These gentlemen did not ascend by the western but the southern side; they found the ascent tolerably easy until they reached the upper and steepest part of the cone, which being covered with loose slags, they sometimes lost in one step the ground they had gained by several. During the ascent the mountain was for awhile enveloped in dense clouds, which prevented them from seeing the chasms in its sides, and they encountered some danger by crossing a narrow ridge of slags that connected one of the lower peaks with the highest. This passage, during which they had a precipice on either side of them, they effected by balancing themselves like rope-dancers. They found these superior craters very incompletely defined, their sides and lips being much shattered and broken away.

The last great eruption of Mount Hecla was in 1766. It broke out suddenly, and was attended at its commencement by an earthquake. It lasted without intermission from the 15th of April to the 7th of September, and did immense damage. The poor horses were so terrified, that they ran wildly about till they dropped down dead through fatigue. The people living near the mountain lost their cattle, which were either choked with the volcanic ashes or starved before they could be removed to grass. A few lingered for a year, and on being opened, the stomachs of these were found to be loaded with ashes.

Other volcanoes in Iceland, though less frequently in action, have caused much greater mischief than Hecla. In 1755 one of these threw out ashes that fell like rain on the Ferroe Islands, at the distance of more than three hundred miles. But the last great eruption (in 1783) was the most terrific of all that are recorded. This proceeded from the mountain of Skaptaa Jokul, and occasioned the desolation we have described in the first of these Icelandic sketches. The reader must understand that the nine thousand human lives were not all directly destroyed by fire or by ashes, but by starvation, the consequence of the burning up of all vegetation on which the flocks and herds subsisted, and of the disappearance of fish from the coasts. At that unhappy season an enormous column of fire cast its glare over the entire island, and was seen, from all sides, at sea, and at the distance of many leagues. Issuing forth with the fire, an immense quantity of brimstone, sand, pumice-stone, and ashes, were carried by the wind, and strewed over the devoted land. The continual smoke and steam darkened the sun, which in colour looked like blood. During the same summer the sun had a similar appearance in Great Britain, and the same obscurity reigned in most parts of our island. Many parts of Holland, Germany, and other countries in the north of Europe, were visited by brimstone vapours, thick smoke, and light grey ashes. Ships sailing between Copenhagen and Norway were covered with brimstone ashes, that stuck to their sails, masts, and decks.

The whole face of the island has been changed by these terrific convulsions, and Sir G. Mackenzie thinks he is safe in estimating that one continued surface of sixty thousand square miles has been subjected to the force of subterraneous fire in this part of the world.

[Mount Hecla.]

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.

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